APPLYING DECISION REQUIREMENTS TO USER-CENTERED DESIGN

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SUMMARY

The decision requirements of a task are the key decisions and how they are made. Most task analysis methods address the steps that have to be followed; decision requirements offer a complementary picture of the critical and difficult judgments and decisions needed to carry out the task. This article describes the use of Cognitive Task Analysis methods to identify decision requirements, as part of a project to improve the decision making of AEGIS cruiser officers in high-stress situations. We found that by identifying these requirements, and centering the system design process on them, we could develop storyboards for a human-computer interface that reflected the user=s needs.

INTRODUCTION

The decision requirements of a task are the key decisions and how they are made. Task analysis methods usually provide a listing of the steps to be followed, but on top of those steps are the difficult and critical decisions that operators must make under conditions of time pressure, ambiguity, shifting situation dynamics, ill-defined goals, and other features of naturalistic environments (see Orasanu & Connolly, 1993).

For example, the steps of making a left turn into traffic are straightforward: signal for the turn, stay in the left lane, slow down when approaching the intersection, wait until there is a safe gap between oncoming cars, and execute the turn. However, a new driver may live in fear of making left turns, and may drive extra blocks to avoid left turns at difficult intersections. A critical and difficult judgment is to determine what constitutes a safe gap. This depends on a number of factors including the speed of the approaching cars, the distance between them, and the ability of the driver to reliably execute the turn within the available time. A display projected onto a windshield calculating left turn opportunities would not be useful because drivers differ in how much risk they will accept, how much time pressure they are facing, how variable their performance is, and even the condition of their cars. This example shows that decision requirements are not limited to choices between options; they can include judgments, situation assessments, and problem-solving activities.

To design better systems, we need to understand these types of decision requirements. Otherwise, system designers are left without useful guidance in how to organize a display. A task listing is usually not sufficient for guidance in human-computer interface (HCI) design. When designers are not given a good sense of the decision requirements of the task, they may fall back on a technology-driven strategy of adding in the newest and fanciest technology that is available, or a data-driven strategy of packing the most data elements into the display, to make sure that nothing essential is left out. The technology-driven approach results in initial enthusiasm, often followed by disillusionment as the operators find they still must wrestle the interface. The data-driven approach is safe, but creates frustration when operators cannot find important data items or detect trends and thereby are unable to make key judgments under time pressure.

Landauer (1995) has described the disappointing results of technology-driven and data-driven approaches, and has argued that a user-centered design approach is needed to identify the needs of the users and to make systems conform to these needs. But the task of identifying and accounting for the users' needs and expectations is daunting. User-centered design may have trouble being put into practice without guidelines and recommendations to make the process more manageable. The challenge is now to develop methods for efficiently capturing and supporting user needs.

The approach we have taken is to focus on the users' judgments and decisions. We have developed methods for defining the decision requirements of a task so that the system designers can anticipate the ways that the interface will be used. For any individual decision requirement we can specify some of the cues and patterns on which experienced operators rely, providing additional guidance for designers. In this way, we can capture some of the most important aspects of the users' needs, and do so in an efficient manner. There is more to user-centered design than supporting decision requirements (e.g., efficiency of operation, navigation aids, and so forth), and many of these considerations are identified during careful test and evaluation cycles. We have concentrated on the decision requirements because these are central to what most systems are expected to support.

An example of a decision requirement of a task would be judging intent. The commander of a Navy AEGIS cruiser may have to judge the intent of an approaching aircraft that has taken off from a hostile country and ignores radio warnings to change course. At earlier stages in an incident, the commander may search for a strategy to warn the aircraft away. At some point the commander may have to decide whether to fire a missile at the aircraft. Throughout the incident, the commander will be trying to understand the intent of the pilot flying the aircraft. HCI designers can use this requirement to suggest ways of configuring a display that makes it easier to infer intent. Trainers can use this decision requirement—to judge the intent of an unknown track—to set up exercises for rapidly gathering and synthesizing data to judge intent.

In this article we describe how decision requirements can be identified and used for designing human-computer interfaces and training programs. The vehicle for our discussions is a project we performed for the U.S. Navy, to improve the decision making of commanders of AEGIS cruisers when faced with airborne threats. The anti-air warfare task in an AEGIS cruiser is highly challenging. The crew must detect and track airborne vehicles (e.g., airplanes, helicopters, missiles) moving at high speeds, as well as surface and subsurface elements that could suddenly launch missiles. The crew must track these vehicles, identify their type, nationality and intent, and respond in a way that ensures defense without provoking hostile reactions. The systems operators can use different sensors to detect and track the vehicles, and can draw on a variety of weapons.

The anti-air warfare team consists of approximately ten individuals including the captain and his key officer, the Tactical Action Officer. All of the team members are positioned at workstations that display graphical information about the tactical picture. The symbology depicts the current evaluation of each vehicle, its position relative to the cruiser, and its current course and speed indicated by a vector associated with the vehicle symbol. Operators interact with the system using a trackball and cursor, as well as a keyboard.

Our interests are more general than AEGIS cruisers. This article uses the AEGIS example to illustrate the use of decision requirements. The next section describes the use of cognitive task analysis to identify decision requirements. Then we discuss the use of decision requirements to design HCI features and training programs. In the Conclusions section we discuss applications of decision requirements in other domains.

IDENTIFYING AND APPLYING DECISION REQUIREMENTS

Decision requirements can be difficult to identify and represent. Key judgments and decisions are subtle, not open to observation, and require interpretation. This section explains why traditional task analysis methods are unsatisfactory, and describes alternative strategies for getting at cognitive processes.

Behavioral task analysis is not well suited to describe decision requirements. Task analyses decompose complex actions into elemental steps, describing the initiating and terminating conditions for each step. The voluminous output of a behavioral task analysis can be considered an algorithm of the steps to be followed in order to complete the task. The analysis captures overt behaviors that can be reliably observed, photographed, timed, and charted. But the behavioral task analysis focuses on what the operator does, and not on how or why. It does not necessarily present the actual strategies and shortcuts used and gives little if any attention to the cognitive strategies employed. The behavioral task analysis can give the impression that people need only to follow the steps from start to finish. The key judgments and decisions get de-emphasized or lost in the details of task decomposition.

Cognitive task analysis (CTA) is better suited to capture decision requirements. Cognitive task analysis refers to methods for getting inside the heads of people, to understand the cues and patterns and relationships they are perceiving, the knowledge they are using, and the strategies they are applying. Many CTA methods use interviews to probe the cues and discriminations that operators are using; sometimes simulated exercises are conducted, in which participants either think aloud while they are performing the tasks or are interviewed immediately afterwards to investigate strategies. In contrast to behavioral task analyses, CTA is better suited to define decision requirements because CTA methods are designed to examine cognitive processes and to understand how people make judgments and decisions. Analysts performing CTA are collecting information that can uncover strategies the operator might not be able to articulate. Researchers have developed a number of different CTA strategies (e.g., Gordon, Schmierer, & Gill, 1993; Klein, Calderwood, & MacGregor, 1989; Redding, 1990; Klein, 1995). These strategies address different types of knowledge, such as declarative knowledge structures, perceptual discriminations, and strategies used to interpret situations.

For the research effort we performed for the U.S. Navy we designed a cognitive task analysis procedure to identify and clarify the decision requirements facing commanders of AEGIS cruisers engaged in low-intensity conflicts involving air threats (Kaempf, Wolf, Thordsen, & Klein, in press). The CTA method we used was a variant of the critical incident method (see Klein et al., 1989) in which participants in nonroutine events are retrospectively interviewed about the judgments and decisions they made in order to understand the cues and strategies they used. We interviewed 14 high-ranking officers who had participated in nonroutine incidents involving anti-air warfare in low-intensity conflicts. The Vincennes incident in which an AEGIS cruiser mistakenly shot down a commercial airliner is an exemplar of a low-intensity conflict. (We did not include this incident in our data.) The 14 incidents included 10 from operational settings and four from training exercises.

Each interview lasted for about two hours. We began by selecting an incident to study. We chose to focus on nonroutine incidents that had actually occurred in the interviewee's experience. The rationale for centering the interviews on nonroutine incidents is that these are cases where expertise is required and is most visible. Routine incidents can often be handled automatically, so the participants may not, therefore, be as aware of the types of judgments they were forced to make. Each participant in the study was asked to recall an incident of low-intensity conflict involving anti-air warfare where the events were nonroutine and challenging and where the interviewee had to make judgments and decisions. Therefore, the project studied actual rather than simulated incidents; the majority of incidents came from operational as opposed to training events.

For each incident, the interviewers charted the events according to time and sequence of decisions. The incident was carefully reviewed to trace the development of situation awareness. Cues and inferences and strategies were also identified and probed. Finally, the participant was asked to speculate where a person of lesser experience might have operated differently during the incident. These could include making mistakes about the nature of the situation, and/or about the actions taken, options selected, and so forth. The rationale for these probes was to further understand the way experienced officers noticed patterns and interpreted events, so that we could ensure that these patterns and interpretations were supported by the HCI features.

To represent the decision requirements, each incident was charted to show the nature of the situation awareness as it evolved during the incident. The charts showed the successive stages of situation awareness along with the types of knowledge influencing the way the situation awareness was formed, and the types of knowledge influencing the way the situation awareness led to courses of action.

One of the incidents is presented in Figure 1, in which the charted information is represented in diagram form. In this incident, which occurred during the Iran-Iraq war, two Iranian F-4s took off from Bandar Abbas airport while an AEGIS cruiser was moving through the Strait of Hormuz. The commander of the AEGIS cruiser expected the F-4s to patrol the coast either to the north or the south. However, they flew an orbit around the end of the runway. The orbit continued to expand, bringing the F-4s closer and closer to the cruiser. Then the F-4s shifted from their search radars to the target acquisition radars, which is considered a hostile act. The F-4s were locking onto the cruiser, which is a preparation for missile launch. The commander interpreted this as an instance of harassment, rather than hostility, since he could not believe that the Iranian pilots would be so foolhardy as to attack an AEGIS cruiser in midday. The commander found it more plausible to interpret the intent of the pilots as harassing him. Nevertheless, he made sure the ship's defenses were prepared in case an attack was made. The electronic warfare operator broke the radar lock on each time the F-4s attempted to reestablish it. Eventually, the F-4s grew tired of the game and flew off.

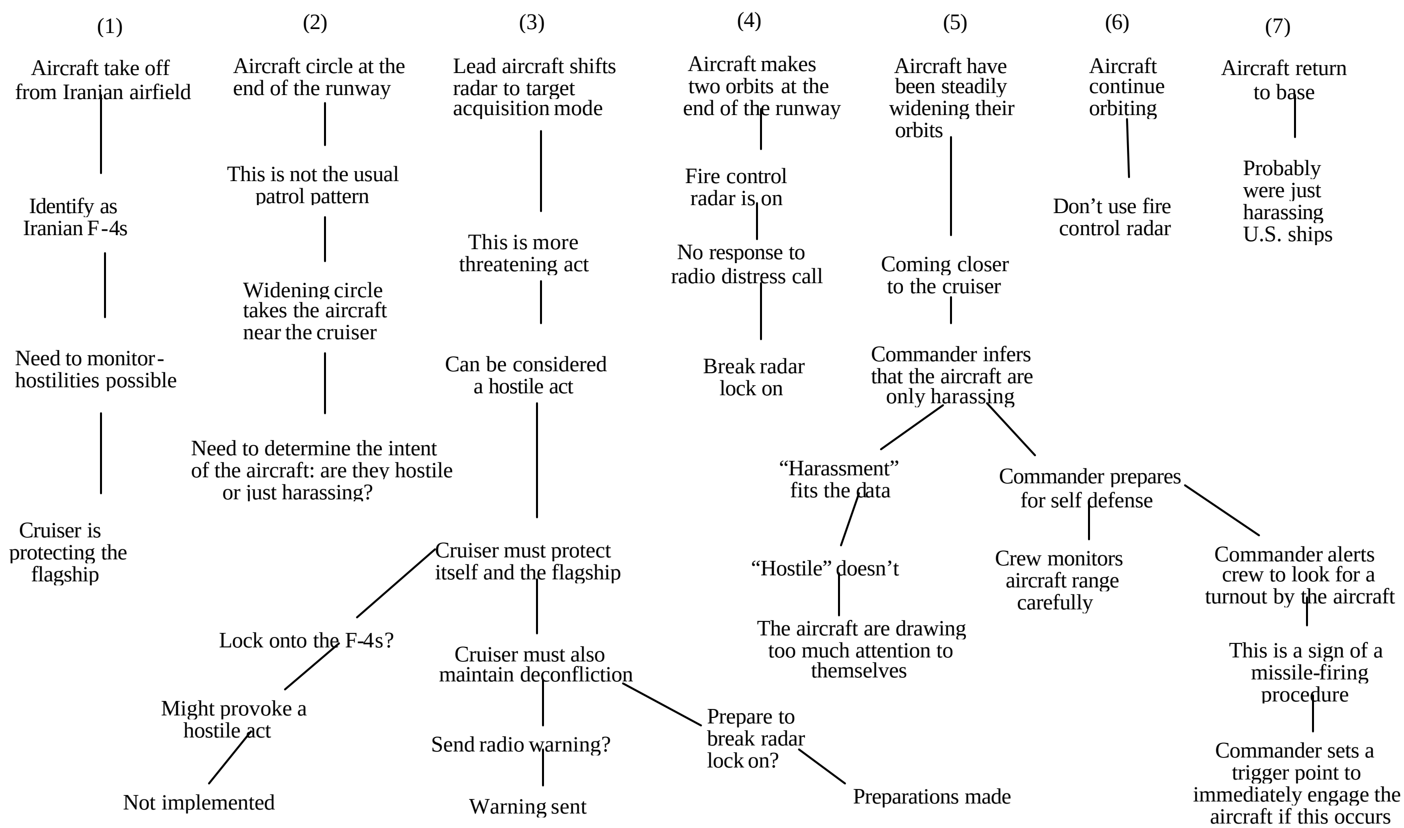


Figure 1. The Harassing F-4s: a diagram of the way the situation was perceived as it evolved.

In Figure 1 the successive stages of situation awareness are presented across the top. The interpretations and analyses of cues are shown beneath each state of situation awareness, to portray the thought processes of the commander as he recounted the incident during the interview. The commander was not wrestling with the decision of whether or not to shoot, since the actions he needed to take were clear. If the intent of the F-4s was hostile, then he needed to prepare to launch missiles at them. If the intent was to harass him, then he needed to avoid escalating the incident. The decision requirement was to judge the intent of the F-4s. He did this by trying to construct a story that fit the observed facts. The story built around a hostile intent contained some implausible elements, so the commander did not attach much credibility to it.

The story built around a harassing intent was more plausible, and formed his interpretation of what was happening.

The purpose of representing the incidents was to analyze the decision requirements and help designers understand how the HCI features would be used during an actual engagement.

Once the 14 incidents were represented, we further analyzed them to identify a set of 15 candidate decision requirements. Using the criteria of criticality, frequency, and difficulty, five of the most important of these were selected. These are listed in Table 1 which presents the frequency of occurrence for each decision requirement as well as the number of incidents in which it was observed. Some of the decision requirements, such as preparing to engage a track, were found to occur several times in a single incident.

The first entry in Table 1 is to *determine the intent of a potential threat*. This decision requirement refers to the need to anticipate what a pilot might be preparing to do. The requirement holds for pilots of aircraft that have not been adequately identified. It also holds for pilots of aircraft from potentially hostile countries since low-intensity conflicts do not permit the treatment of such aircraft as hostile until they have clearly demonstrated a hostile intent, such as firing missiles at the Navy battle group. Table 1 shows that five of the 14 incidents included the requirement to judge intent. All of these came from operational events, as opposed to training exercises. In addition to frequency, the difficulty of this judgment and its criticality made it one of the primary decision requirements we identified.

Table 1.
Primary Decision Requirements for AEGIS Anti-Air Warfare

What is the difficult decision?	**Why is it difficult?**	**How is the decision made?**	**What is the HCI aid and how will it help?**	**Frequency**	**# of Incidents N = 14**
Determining intent	Operator relies on ambiguous data; task requires memory of past as well as current events	Often involves story generation to assimilate cues; critical cues include course, range, and point of origin	1. Trend Data— allow for judgments of a track's behavior (particularly speed, altitude, and range) over time 2. History— provides a mechanism to both generate and evaluate hypotheses	7	5
Recognizing a problem	A large number of tracks are monitored for changes in any of several key parameters	Operator must detect changes in track behavior; critical cues include course and the detection of radar emissions	Tripwires—key parameters are monitored by the system; a message is provided to the operator when a track violates any parameter	10	10
Avoiding escalation	Operator must ensure self-defense, but avoid escalation	Operator monitors the changing risk associated with a suspicious track; most critical cue was range	1. Weapon's Release Range (WRR)— allows the operator to evaluate the level of risk associated with the track 2. Trial Intercept— helps operator select appropriate intercepting aircraft; aids in timing decisions when used with the WRR feature	5	4

What is the difficult decision?	**Why is it difficult?**	**How is the decision made?**	**What is the HCI aid and how will it help?**	**Frequency**	**# of Incidents N = 14**
Identifying a track	Many pieces of data fit with multiple hypotheses; missing data can be obscured by the salience of data in-hand	Often involves feature matching to make an initial assessment of track identity; critical cues include speed, course, electronic emissions, and altitude	Identify— presents the three most plausible hypotheses regarding a track's identity; displays matching and non-matching elements to reduce confirmation bias	16	10
Engaging a track	Need to ensure that no friendlies are at risk; operator may need to weigh the tradeoff between weapon accuracy and risk	Operator must balance risk against the probability of a successful engagement; critical cues include range and course	1. Weapon's Release Range— allows the operator to assess the level of risk associated with "holding off" from engaging a track	11	4

The second entry in Table 1 is to *recognize the existence of a problem.* This refers to the crew being able to scan through all of the tracks on their screens and quickly judge that a given track has the potential to create difficulty and should be more carefully monitored. Crews that are slow to recognize problems can limit their reaction time and foreclose on options. We found this type of judgment in 10 out of 14 incidents studied, and assessment of the incidents also showed it to be critical although not as difficult as determining intent. The remaining decision requirements in Table 1, *avoiding escalation*, *identifying a track*, and *engaging a track*, have their own unique challenges and strategies.

For each of the five decision requirements listed in Table 1, we reviewed all of the incidents in which it occurred to identify how the decision makers used cues, patterns, inferences, and strategies to fulfill the requirement. For example, *determining intent* often depended on a story building strategy to see if different hypotheses fit the available facts, as discussed in the incident with the circling F-4s. *Preparing to engage a threat* requires a clear visualization of factors such as the effective firing range of the AEGIS cruiser and the target, along with timing issues. *Recognizing a problem* usually relied on matching the features of the current situation to mental "templates" they had about other types of situations to determine if the AEGIS cruiser was vulnerable to a track that might choose to attack. *Trying to avoid escalation* involves problem solving to find a defensive course of action and anticipate whether it might provoke an attack.

DECISION-CENTERED DESIGN OF A HUMAN-COMPUTER INTERFACE

The rationale for identifying decision requirements is to use them to guide the design process. This step is captured in the fourth column of Table 1. The process of transforming decision requirements into design recommendations is a critical one. This section describes how we used the decision requirements to recommend HCI features, a decision-centered design strategy. The next section describes a project in which we used the same decision requirements to design a training intervention, a decision-centered training strategy.

Miller, Wolf, Thordsen, and Klein (1992) used the decision requirements shown in Table 1 to generate recommendations for the human-computer interface used by the commander and by the Tactical Action Officer of the AEGIS cruiser. We used the current interface as a starting point — i.e., we were not trying to specify an HCI from the ground up, but rather to use an incremental approach by specifying the modifications and enhancements that would need to be made from the existing HCI. For each decision requirement, we reviewed the incidents to identify HCI concepts that could have provided useful support to the commander and the Tactical Action Officer. We worked from the decision requirements themselves, but we found it even more helpful to go back to the incident accounts from which the decision requirements were derived, to gain a better sense of what the officers could have used in the context of the specific events. That is, rather than just referring to the need to infer intent, we looked at the five incidents in which this was necessary in order to learn about the patterns and cues that were needed. At critical points in the incident we tried to identify the type of information or perspective that could have made it easier to handle the requirement. This process enabled us to recommend HCI features for each decision requirement in Table 1, along with the central cues and patterns that needed to be highlighted.

The process of using decision requirements to generate HCI features depended on our subjective judgment. At the same time, it represents a step forward from just trying to fit the information available onto screens. We were prioritizing the data elements, organizing them, and finding ways to make critical trends more visible. The decision requirements permitted us to take the users' perspective into account in ways that would not have been possible if we only knew the data elements (track altitude, speed, bearing, nationality, platform) and not how the commander and Tactical Action Officers were using this information. The decision-centered design approach is not a mechanical procedure that can be run to transform cognitive task analysis data into HCI features. However, it is possible to trace the HCI features backward to the decision requirements and the incidents themselves as an audit trail.

For the decision requirement of *determining intent*, we found that commanders and Tactical Action Officers reported heightened sensitivity to trends in a track's speed, altitude, and range, as well as a need to detect sudden changes in these trends. Accordingly, we designed a track information box to present detailed information about a track of interest, shown in Figure 2. It is designed to replace the current Character Read Out display, shown in the upper right hand corner of Figure 2. The differences are clear. The revised version shows the speed, and also permits the operator to get an exploded look at the changes in speed over time (Figure 3a). The revised HCI shows altitude trend (whether the track is increasing or decreasing in altitude) rather than just the 4-digit alphanumeric. Furthermore, the operator can also get a trend line to gauge changes over time. (This is shown in Figure 3b.) In addition, the revised HCI used upper and lower case letters, a simple ergonomics shift to increase readability. The revised HCI groups the elements rather than listing them in an unbroken series that is difficult to read. For most tracks, operators would have no reason to look at these time series, but for tactically significant tracks, the time series data would be highly pertinent.

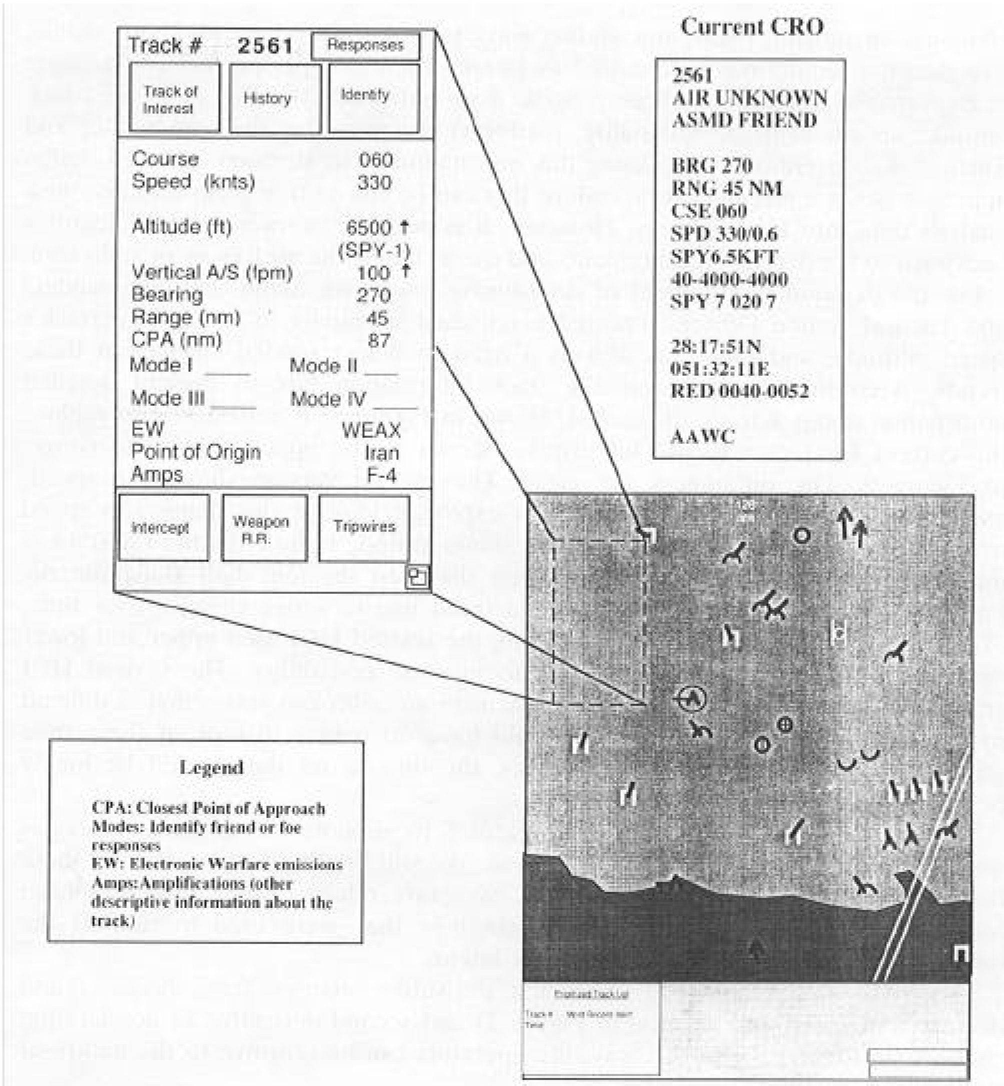
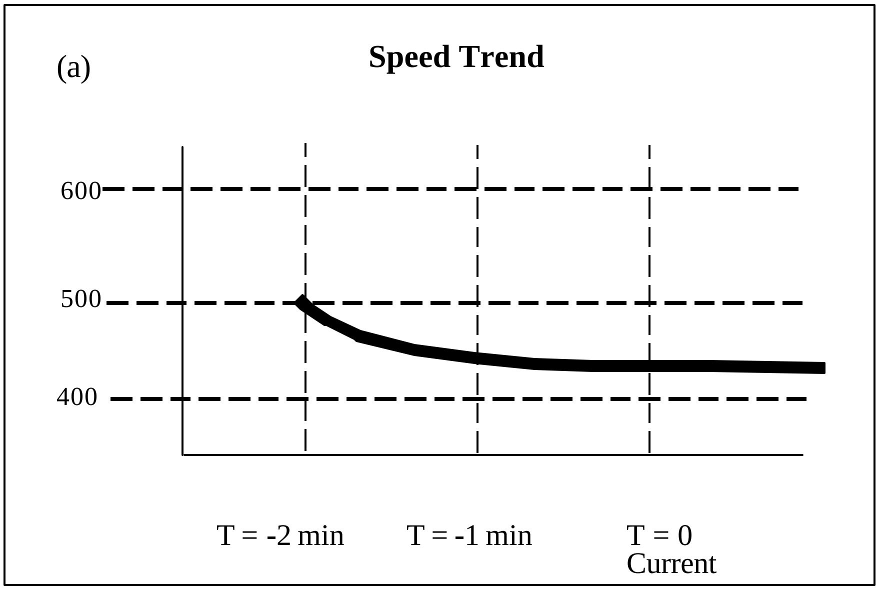


Figure 2. Track Information Box.



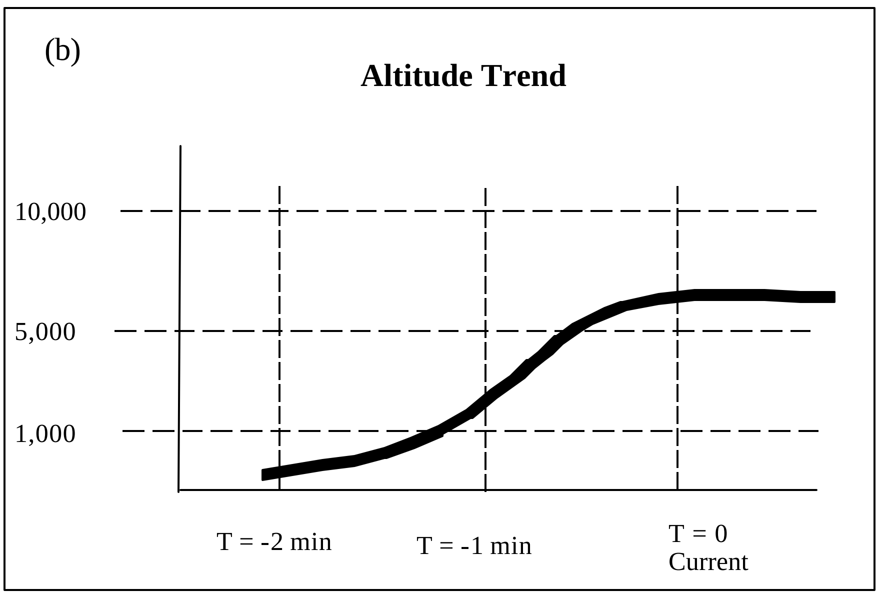


Figure 3. (a) Speed trends. (b) Altitude trends.

The revised version has additional features to support the decision strategies uncovered during the cognitive task analysis. We will briefly describe some of these features — trend data, history, tripwires, weapons release range, and graphical portrayal of track history — and then show how they were used to support the decision requirement of determining track intent.

The trend data graphically show first derivative changes (e.g., increases and decreases in speed and altitude in Figure 2) and second derivative or acceleration changes (in Figures 3a and 3b). In this way, the operators can be sensitive to the nature of shifts in the situation.

Graphical Portrayal of Track History shows the key events pertaining to a track of interest, so a decision maker can test out different stories about the intent of the aircraft's pilot. In reviewing the five incidents where officers needed to determine a pilot's intent, we found that story-building activities were used frequently. Furthermore, Barnett (1993) has shown that information from early in an event tends to be more easily forgotten. Therefore, the graphic history feature would allow the operators to consider factors that they might well have forgotten by the time a track became tactically significant. Figure 4 presents an example.

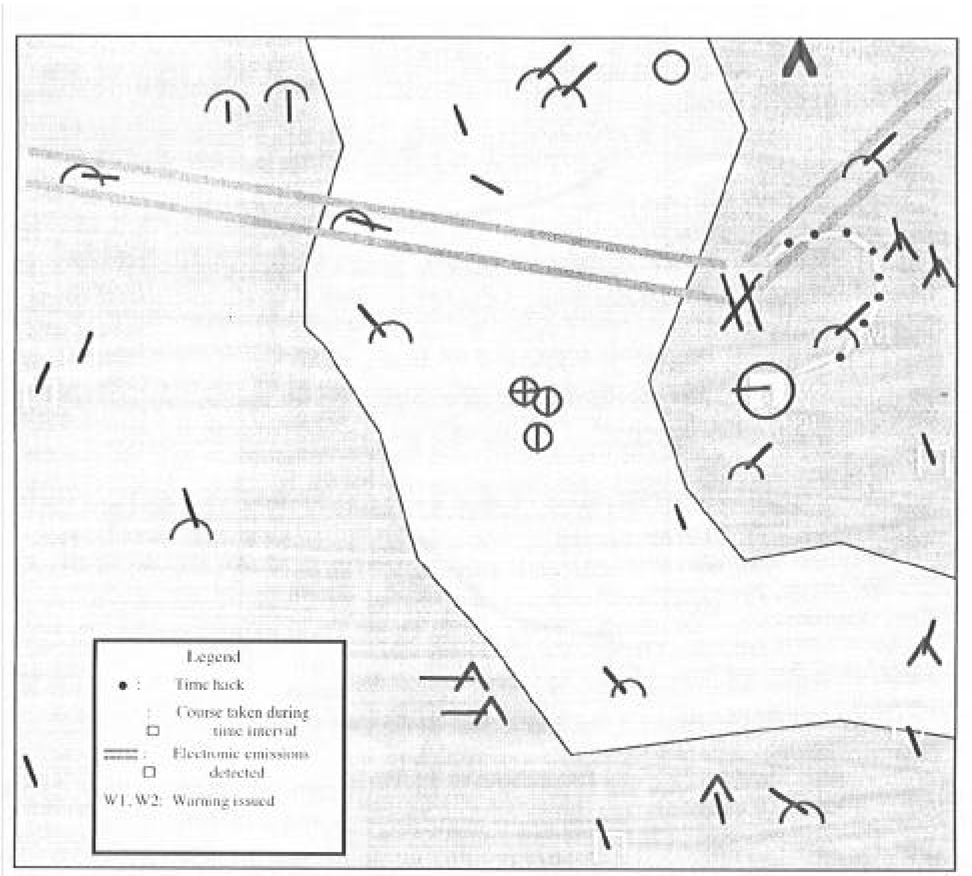


Figure 4. HCI Storyboard: History of a Track.

Tripwires are ways of setting values in the workstation to get automatic alerts when a track demands careful attention (e.g., suddenly increases speed, changes heading towards key assets, initiates radar lock-on procedures); given the possibility of screen clutter, this can help alert operators to the beginnings of a problem. The tripwires take advantage of the operators' experiences and expectancies and allow them to anticipate the early signs of problems, place the tripwires accordingly, and focus attention on more dynamic parts of the situation.

Weapons release ranges are shown graphically for friendly and for potentially hostile tracks, to enable operators to visualize the last possible moment prior to engaging a track; high-intensity conflicts require the earliest possible engagement of threats, whereas the low-intensity conflicts we studied required the commanders to wait until the last possible moment. We found that the more experienced operators were able to wait longer during an incident to obtain track identification information, and thereby avoided fratricide on several occasions. In contrast, less-experienced officers seemed more apt to engage targets as soon as they felt threatened. By providing weapons release ranges we were trying to provide the less-experienced officers with a display that would help them gather information prior to engaging a target.

Miller et al. (1992) made additional recommendations, but these examples serve to illustrate the way HCI features can be based on the cognitive task analyses and on the decision requirements.

DECISION-CENTERED TRAINING

Decision requirements can be used to recommend training interventions as well as for designing HCI features. Once we understand the key decisions and how they are made, we can use these to define the type of training program needed. For example, using the information in Table 1, along with the detailed incident accounts, we can determine that AEGIS officers will need to determine the intent of possible threats, which suggests exercises and scenarios that can provide the necessary experience. In addition, the cognitive task analysis products themselves can be used as training materials.

Cohen, Freeman, and Wolf (1995), performed a project in which the decision requirements shown in Table 1 were used to help guide the development of training interventions that could prepare navy commanders and Tactical Action Officers to make better decisions during low-intensity conflicts. Cohen et al. used the cognitive task analyses to determine the types of errors and difficulties that had arisen in actual incidents as officers wrestled with these decision requirements. Cohen et al. developed several training interventions, including the following:

- Scenario development used actual incidents to present judgment and decision challenges in accordance with the decision requirements. The incidents were modified to sharpen the demands on the trainees.

- Cognitive modeling used descriptions of proficient decision making to illustrate how experts size up situations and to show trainees what to consider. The trainees could compare their own approaches to the ones used by people with more expertise.

- Cognitive feedback used after-action reviews of performance in simulated exercises, inquiring into the processes used to make decisions, rather than just looking at the choices made.

Preliminary data (Cohen et al., 1995) suggests that the decision-centered training was effective in helping the Tactical Action Officers in several ways. For example, in learning to gauge intent, the training seemed to help the trainees consider alternative possibilities. However, the training did not appear to reduce the reaction time to make decisions. If anything, the training seemed to increase the sensitivity to time pressures.

Decision requirements make the job of curriculum development more tractable. In formulating a program for training commanders to handle low-intensity conflicts, a training developer can go down many different paths, and can take up the entire course with factual information relevant in these settings. However, consider what happens if we incorporate a decision requirement, e.g., determining intent. A host of materials from historical incidents becomes relevant for illustrating how intent was inferred and where mistakes were made. Scenarios can be developed that pose dilemmas about intent, create certain types of ambiguity, and require the trainee to judge which types of information are necessary and are easy to obtain within the time constraints. The feedback session can be directed at the strategies used to make the inferences, along with the metacognitive strategies for carrying out the responsibilities.

In using decision requirements to guide training, it should be possible to extend current systems approaches to training, which concentrate on the ***behavioral*** tasks to be performed. Decision requirements enable training developers to identify some of the ***cognitive*** aspects of proficient task performance. If we can help trainees learn how to size up situations and make decisions, we can do a better job of teaching cognitive skills that can generalize across domains and across contexts.

DISCUSSION

The use of decision requirements for designing systems and interfaces is a decision-centered design strategy. Decision-centered design of software systems and of human-computer interfaces has been used in domains other than U.S. Navy AEGIS cruisers. These include a redesign of the weapons director station of the Airborne Warning and Command System (AWACS) that resulted in approximately 20% improvement in performance (Klinger & Gomes, 1993), and a design of a workstation for weaponeers (Miller & Lim, 1993). Both of these efforts were accomplished in less than a year. The Cognitive Task Analysis took approximately three months to conduct the interviews, followed by two months to analyze the data, another two months to convert the decision requirements into conceptual specifications and two-three months to develop software for the prototype systems. There appears to be three primary advantages of this strategy: the resulting system and HCI are significantly better as a result of using decision requirements; the software development proceeds more smoothly because the software engineers have a better idea of the end goals; and the process reduces the need for redesign cycles which add expense and time delays.

The use of decision requirements for developing training interventions, decision-centered training, has also been used with domains other than AEGIS cruisers. These include nursing (Crandall & Getchell-Reiter, 1993), software programming (Riedl, Weitzenfeld, Freeman, Klein, & Musa, 1991), and firefighting (National Fire Academy course materials, 1995).

We hope that the strategies we have described will help other professionals take decision making into account when designing decision support systems, human-computer interfaces, and training programs. The use of decision requirements may allow practitioners to address decision tasks that are outside the range of methods such as GOMS (Card, Moran, and Newell, 1983), which model human processors for more procedural tasks. By extending the range of methods for user-centered design activities, we will be able to increase the range of tasks that can be supported. Another advantage of the approach described in this article is that the same decision requirements can be applied to both system design and training, in a variety of domains, which suggests that the approach will be generalizable. The field of human factors and ergonomics has made tremendous progress in helping people perform behavioral tasks, to reduce errors and accidents and to increase efficiency. We believe that it is also possible to support and improve decision tasks.

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